PATENT ABSTRACTS OF JAPAN

(11)Publication number : 08-191684
(43)Date of publication of application : 30.07.1996

(51)Int.Cl. C12M 1/38

(21)Application number : 07-021081
(22)Date of filing : 12.01.1995

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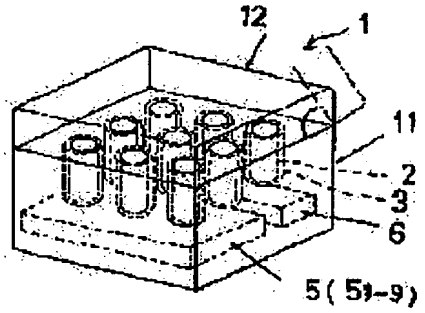
(54) INDIVIDUAL TEMPERATURE CONTROLLED CHAMBER

(57)Abstract:
PURPOSE: To provide a small-sized individual temperature controlled chamber (especially incubator) capable of simultaneously advancing tests, etc., under different temperature conditions, rapidly raising temperature, simply controlling temperature in high accuracy, maintaining a stable temperature environment and having simplicity and high performances.
CONSTITUTION: This individual temperature controlled chamber is equipped with a box 1, plural containers 2 made of a thermally conductive material which are arranged in the box and house plural specimen packing receptacles, each heating means (flexible facial heating element to be attached to the container) 3 to heat each container, each temperature sensor to be fixed to each container and a control circuit 5 which is electrically connected to each heating means and each temperature sensor and can individually control temperature so as to heat each container to fixed set temperature. The facial heating element 3 is provided with a base layer made of a resin or rubber and a heating pattern layer formed on the base layer. The plural containers 2, the plural heating means 3 and the plural temperature sensors constitute a unit and one or more of the units are housed in the box 1.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision

of rejection]
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[Date of extinction of right]
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CLAIMS

[Claim(s)]
[Claim 1] Two or more hold containers 2 which are arranged in a box 1 and this box, and hold two or more specimen or specimen restoration containers, Each heating means 3 to heat this each hold container, and each temperature sensor 4 with which this each hold container is equipped, The control circuit 5 which can do temperature control individually so that it may connect with this each heating means and this each temperature sensor electrically and may become desired laying temperature, A preparation and the above-mentioned hold container 2 consist of the thermally conductive quality of the material. The above-mentioned heating means 3 Consist of a flexible planar heating element attached in this hold container, and this planar heating element is equipped with the exoergic patterned layer 32 formed on the product made of resin or the base material layer 31 made of rubber, and this base material layer. The individual temperature-control mold container characterized by for two or more above-mentioned hold containers, two or more above-mentioned heating means, and two or more above-mentioned temperature sensors constituting one unit, and containing one or more [of this unit] in the above-mentioned box.
[Claim 2] The above-mentioned individual temperature-control mold container is an individual temperature-control warehouse according to claim 1 used as an incubator.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] Synchronization, such as a trial of different temperature conditions, can

do this invention in more detail about an individual temperature-control warehouse, early, a highly precise temperature control is made simple, the stable temperature environment can be maintained and the standup of temperature is related with a highly efficient individual temperature-control warehouse simple small and. Especially this invention is used for the warehouse (container) used when back-analyzing, or analyzing predetermined physical properties etc. after [which was held under different temperature] making it cultivate or react at different temperature.

[0002]

[Description of the Prior Art] In the trial for investigating the effect of the reactivity over research or temperature of bacteria, and physical properties etc., the need of maintaining the specimen at a predetermined temperature environment fixed time amount (or period) exists mostly. as equipment for this -- constant temperature -- a constant humidity chamber, a hot-water-circulating type cultivation tank, and simple constant temperature -- the case etc. is used.

[0003] the above -- constant temperature -- since it has the opening 83 by the side of the front face of the box 81 outside a body, the hold warehouse 82, and a hold warehouse, the inner door 84, and the outside door 85, among these a door 84 and the outside door 85 blockade opening 83 as shown in drawing 6 , the constant humidity chamber 8 is attached in the box 81 outside a body respectively free [closing motion]. As an engine water jacket 86 wraps in the hold warehouse 82, it is formed in the box 81 outside a body. Furthermore, when it has a sensor 88, a coolant temperature sensor 89, input means 89a, and control unit 89b whenever [heater 87 and warehouse internal temperature] and control unit 89b carries out drive control of a heater 87 based on the output signal of a sensor 88 and a coolant temperature sensor 89 the laying temperature specified by input means 89a and whenever [warehouse internal temperature], it is adjusted so that whenever [warehouse internal temperature] may become equal to laying temperature. in addition, other constant temperature -- as a constant humidity chamber, the part of the above-mentioned water jacket is transposed to an air space, and there is also a thing of an air circuit system which performs temperature control by the fan.

[0004] To be shown in drawing 7 , the above-mentioned hot-water-circulating type cultivation tank 9 is equipped with the circulating pump 92 and the Mikata automatic regulating valve 93 which send a cultivation tank 91 and warm water into a cultivation tank 91, and controls the amount of warm water which flows into a cultivation tank 91 with the control output signal of the cultivation tank temperature controller 95. Furthermore, it has [whenever / cultivation tank internal temperature] a detector 99 and temperature-controller 99a whenever [warm water tub / which stores a detector 94, the cultivation tank temperature controller 95, and warm water / 96, heating heater 97, cooling water valve / for cooling water supply / 98, and warm water tub internal temperature], and the control output signal of automatic-controller 99a performs heating and cooling whenever [warm water tank temperature].

[0005] the above -- constant temperature -- as shown in drawing 8 , a case 10 is equipped with the box 101 outside a body, and the inner box 102, and serves as a closed space with the inner box 102 and the box 101 outside a body in the space section 103. Furthermore, it has a front door 104 and the hold warehouse 105, and is intercepted with the open air by closing a front door 104. Furthermore, it has a heater 106, the circulation fan 107, a thermo sensor 108, and a thermostat 109, and while a thermostat 109 carries out drive control of a heater 106 and carries out temperature control based on the output signal of a thermo sensor 108, the circulation fan 107 circulates the air which has wrapped the hold warehouse 105, and it is made for the whole to serve as uniform temperature. in addition, other constant temperature -- as a case, the above-mentioned space section and an above-mentioned circulation fan are lost, and there is also a thing of a configuration of having stuck the heater on any (or plurality) of the base of a hold warehouse, a tooth back, and a side face.

[0006]

[Problem(s) to be Solved by the Invention] However, there is a trouble as each shows below about three thermostats of the above-mentioned former.

(1) The preheating time for making the whole hold warehouse into predetermined temperature is

the long duration need in advance. That is, since the convection-current room of air is needed for perimeters, such as a culture bottle, the volume of the whole hold warehouse is compared with the volume of a culture bottle etc., and needs a 3 to 5 times as many size as this. The preheating time for making the whole result in constant temperature is required. Furthermore, in order to make a hold warehouse into predetermined temperature, the temperature of the water which contains it first, or air is controlled, and the phase which makes a hold warehouse stable temperature secondarily is followed. Moreover, since the water of a periphery or the heat capacity of air is enough enlarged compared with the hold warehouse in order to lessen temperature effect by closing motion of a door etc., as for the setup time for a preheating, it is common to require several hours.

[0007] (2) It is very difficult to carry out in parallel culture, the reaction, etc. of temperature conditions which are different in coincidence with one thermostat. That is, it is the structure which makes the whole hold warehouse constant temperature, and culture, the reaction, etc. of temperature conditions which are different in coincidence with one thermostat cannot be carried out in parallel. Therefore, it is necessary to prepare two or more same thermostats to carry out synchronization of the difference when changing temperature conditions into several steps, and compare it.

[0008] (3) Before equipment is large and takes out test results, such as culture and a reaction, it will take time amount. For example, even if it thinks that doctors in charge, such as otorhinolaryngology and dentistry, want to extract some of body fluid and organizations from a patient, to cultivate a short time on that spot, and to diagnose the situation of contagion etc. early, results cannot be quickly achieved over the present incubator. moreover, the trial held to each laying temperature if 1 equipment performs this trial, since the trial which changed temperature conditions into coincidence with 1 equipment cannot be performed -- multiple times -- since it will carry out repeatedly, that trial takes time amount. Synchronization, such as a trial of different temperature conditions, can do this invention, early, a highly precise temperature control is made simple, the stable temperature environment can be maintained and the standup of temperature aims at offering a highly efficient individual temperature-control warehouse simple small and.

[0009]

[Means for Solving the Problem] Two or more hold containers 2 which the individual temperature-control warehouse of this invention is arranged in a box 1 and this box, and hold two or more specimen or specimen restoration containers, Each heating means 3 to heat this each hold container, and each temperature sensor 4 with which this each hold container is equipped, The control circuit 5 which can do temperature control individually so that it may connect with this each heating means and this each temperature sensor electrically and may become desired laying temperature, A preparation and the above-mentioned hold container 2 consist of the thermally conductive quality of the material. The above-mentioned heating means 3 Consist of a flexible planar heating element attached in this hold container, and this planar heating element is equipped with the exoergic patterned layer 32 formed on the product made of resin or the base material layer 31 made of rubber, and this base material layer. Two or more above-mentioned hold containers, two or more above-mentioned heating means, and two or more above-mentioned temperature sensors constitute one unit, and it is characterized by containing one or more [of this unit] in the above-mentioned box.

[0010] Although it is the outside periphery front face of the above-mentioned hold container, the location in which the above-mentioned flexible planar heating element is attached is not limited to this, but when attaching the base of this hold container, or a lid, it may usually be further attached in that lid at those two or more places. Furthermore, this anchoring location is not limited to the outside of this hold container, but may be attached in inner skin. Furthermore, the configuration of this flexible planar heating element is [that what is necessary is just to have the predetermined base material layer 31 and the predetermined exoergic patterned layer 32] good also as a planar heating element beforehand equipped with a glue line inside (to opposite side of a base material). Furthermore, also when attaching this planar heating element with adhesives, the whole surface of this planar heating element is sufficient as this adhesives layer, and only

that part, for example, outside periphery, side is good. The above-mentioned individual temperature-control mold container can be used as an incubator.
[0011]
[Function and Effect(s) of the Invention] Heating effectiveness is also excellent while it can heat the direct specimen, since the individual temperature-control warehouse of this invention made each specimen or specimen restoration container ("the specimen is said.") to be used hold in each hold container and has moreover equipped this each with the planar heating element. Moreover, since it has the control circuit which can carry out temperature control of each of this planar heating element according to an individual, temperature control can be carried out according to an individual. Therefore, if this individual temperature-control warehouse is used, the standup of temperature can perform a highly precise temperature control simple early, and, moreover, synchronization, such as a trial of different temperature conditions, can be performed. And the configuration can also be used as a compact. Moreover, a temperature anomaly can be very small, and can perform a highly precise temperature control simple, and the futility of a power loss and time amount can be excluded. furthermore -- and since the temperature of a hold container is controlled according to an individual, the temperature environment which was not influenced of receipts and payments, such as specimen of an adjoining part, therefore was always stabilized can be maintained.
[0012] As mentioned above, according to this individual temperature-control warehouse, it is very useful, when making it cultivate at different temperature, or analyzing predetermined physical properties etc. after making it react, analyzing a subsequent culture or a subsequent reactant or holding under different temperature further. Furthermore, the volume of the whole equipment can be made small, when it is required to perform simply quickly the trial which investigates the effect to temperature, it is very useful, and drastic reduction of power consumption can be further performed for partial generation of heat by partial temperature management.
[0013]
[Example] Hereafter, an example explains this invention concretely based on drawing 1 -4. The individual temperature-control warehouse of this example is used as an incubator, and this incubator serves as a box 1, nine hold containers 2, each heating means 3, and each temperature sensor 4 from a control circuit 5. That is, there are 9 sets of assemblies of the hold container 2, the heating means 3, and a temperature sensor 4, and, moreover, 9 sets of these one units are held in the box 1.
[0014] The above-mentioned box (about 100x120x100mm) 1 consists of the receipt box (about 100x120x80mm) 11 and top cover 12 which contain the hold container 2 which holds the culture bottle 7. Besides, a lid 12 is attached free [closing motion in the receipt box 11], and commits cutoff with the open air in addition to the time of receipts and payments of the culture bottle 7. These consist of acrylic resin, polypropylene, etc. and, moreover, are not using the special heat insulator. Moreover, although the whole magnitude is the minimum magnitude of the range which can hold all hold containers and does not have trouble in an activity, it is not limited to this magnitude. In addition, a special heat insulator can also be used and it can also consider as other products made of resin, or metal. Moreover, instead of a culture bottle, it can also consider as a culture container like a petri dish, and the hold container of the magnitude and the configuration corresponding to this magnitude and configuration will be used in this case. Thus, in that of a ******** potato, it is desirable to equip a base side with a heating means.
[0015] That what is necessary is just the magnitude and the configuration where the culture bottle (you may use it as it is when the specimen is a solid-state, or when it is a gestalt object.) 7 in which specimen hold is possible can be held, the above-mentioned hold container 2 can be made into a cylinder-like thing, as shown in drawing 1 and 2. In this case, upper limit disconnection is sufficient and you may enable it to attach a top cover so that it may illustrate. This hold container 2 is metal (for example, product made from ARUMIUMU) light-gage (for example, about 0.5-1mm) with a big bore for a while, and excels the outer diameter (about 18mmphi) of the culture bottle 7 in thermal conductivity. In addition, the bacillus and cell extracted in the culture bottle 7, or the element of an organization is put in, and a culture

examination is carried out.
[0016] A planar heating element 3 is used as the above-mentioned heating means. This planar heating element 3 heats a hold container, as a result the specimen (a liquid, a solid-state, or a gestalt object is not asked.) held, filled up with or arranged in this. And the stainless steel foil (exoergic patterned layer) 32 pastes one side of the silicone film base material 31, and this planar heating element 3 is excellent in flexibility. this planar heating element 3 encloses the periphery of the hold container 2 -- as -- a glue line (insulating layer) 33 -- minding -- this silicone film base material 31 -- an outside -- and that whole surface has pasted up so that it may stick. This exoergic pattern is shown in drawing 3 . This exoergic patterned layer 32 is formed of technique, such as etching. This pattern is not limited to especially the pattern shown in drawing 3 , but should just have the width of face and the pattern configuration of die length which were calculated so that necessary calorific value might be obtained.
[0017] Each hold container is equipped with the above-mentioned temperature sensor (temperature detection thermistor) 4. In this example, it is close and the base of the hold container 2 is equipped. In addition, this wearing location may not be limited to this, but may be a side periphery side, and may be the inside side of a hold container.
[0018] The above-mentioned control circuit 5 is one electronic control circuit 51-9 where it connects with each planar heating element 3 and each temperature sensor 4 electrically respectively, namely, the assembly of the hold container 2, the heating means 3, and a temperature sensor 4 became independent to those with 9 set, and its each. It connects. It has come to be able to do temperature control individually thereby so that it may become desired laying temperature. One line of this control circuit is shown in drawing 4 . Five are an electronic-circuitry substrate among drawing 1 , and they are nine electronic control circuits 51-9. It is dedicated to the printed circuit board of one sheet. 6 shows a power circuit. By this electronic control circuit 5, when the temperature sensed with the temperature sensor 4 is lower than predetermined laying temperature, a current is supplied to a planar heating element 3, and in being higher than predetermined temperature, it operates so that the current to a planar heating element 3 may be intercepted. Thereby, the temperature of the hold container 2 is maintained at laying temperature. 51 are a thermoregulator among drawing 4 , it is contained in the electronic control circuit 5, and it is possible for this to change laying temperature into arbitration.
[0019] In the individual temperature-control warehouse concerning this example, since each hold container is prepared for every culture bottle and close wearing of the planar heating element is carried out at each, it controls according to an individual and a temperature control is made. Therefore, the standup of temperature is very early in order to end with heating of a necessary minimum part. For example, when making into the same 37 degrees C as temperature what carried out heat insulation (5-8 degrees C) in the refrigerator, you can make it reached and stabilized within 5 minutes. moreover, a temperature anomaly -- being very small (this example less than **0.2 degrees C) -- a highly precise temperature control can be performed simple and the futility of a power loss and time amount can be excluded. Furthermore, since it controls according to an individual, it cannot be influenced by the culture bottle of an adjoining part of receipts and payments, but the always stabilized temperature environment can be maintained.
[0020] Moreover, synchronization of the culture examination of different temperature conditions can be carried out in parallel in one container. For example, predetermined time (for example, fixed time amount) culture of the sample of the same kind can be carried out under temperature conditions which are [degrees C / 40 degrees C 50 degrees C, / 60 etc.] different, respectively, and a comparative study can be performed to coincidence. In the former, while taking time amount in order to perform one every trial one by one when the location of equipment cost and many was needed and one equipment performed, in order to use two or more thermostats for coincidence, a coincidence comparative study was not completed. Furthermore, one by one, since it can be respectively set as predetermined temperature at coincidence for 30 degrees C -> 40 degrees C -> 50 degrees C -> 40 degrees C -> 30 etc. degrees C etc. to carry out a cycle test, and evaluate the sample sampled for every fixed time amount, compared with the former, quick evaluation can do it. Moreover, the volume of the whole equipment is made small and drastic reduction of power consumption can be further performed

for partial generation of heat by partial temperature management.
[0021] As mentioned above, a main culture machine is the highly efficient thing [oneself, optimal a check and in order to diagnose and to take suitable measures] simple small and about the existence and the situation of contagion, after special doctors in charge, such as otorhinolaryngology and dentistry, cultivate the pituita, the sputum, saliva, dental plaque, etc. extracted from the patient during scheduled time at constant temperature.
[0022] In addition, in this invention, it is not restricted to what is shown in said concrete example, but can consider as the example variously changed within the limits of this invention according to the purpose and the application. For example, connection of a control circuit can be made in the configuration which did not necessarily need to limit to one unit with one hold container, for example, combined the multi-unit with length or a row. for example, it is shown in drawing 5 -- as -- a hold container, a planar heating element, and three temperature sensor **** (2-1-3, 3-1-3, and 4-1-3 --) 2-4-6 And 3-4-6 And 4-4-6 and 2-7-9 And 3-7-9 And it is good also as a configuration which makes 4-7-9 1 block, connects the control circuit (5-1, 5-2, 5-3) of one unit to the each, and is controlled to the same temperature for every block. Of course, a setup of the combination of the number is not limited. Furthermore, also about arrangement, it is not limited to a juxtaposition but laminating arrangement can also be carried out.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the whole individual temperature-control warehouse perspective view concerning an example.
[Drawing 2] It is the explanation sectional view showing the hold container and planar heating element which were used in the example.
[Drawing 3] It is the explanatory view showing the heating element pattern of the planar heating element used in the example.
[Drawing 4] It is the explanatory view showing one line of the control circuit used in the example.

[Drawing 5] It is the explanatory view showing the connection network in another example.
[Drawing 6] the conventional constant temperature -- it is the explanation sectional view of a constant humidity chamber.
[Drawing 7] It is the explanatory view of the conventional hot-water-circulating type cultivation tank.
[Drawing 8] the conventional constant temperature -- it is the explanation sectional view of a case.
[Description of Notations]
1; -- a box, 11; receipt box, the 12; top cover 2, a hold container, 3; heating means (planar heating element), 31; silicone film base material, and 32; -- a stainless steel foil, 33; insulating

layer (glue line), 4; temperature sensor, 5; control circuit, and 6; power circuit.

[Translation done.]

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号

特開平8－191684

(43)公開日　平成８年(1996)７月30日

(51)Int.Cl.[6]	識別記号	庁内整理番号	ＦＩ	技術表示箇所
Ｃ１２Ｍ　1/38		Ｚ		

審査請求　未請求　請求項の数２　ＦＤ　（全 6 頁）

(21)出願番号　特願平7－21081

(22)出願日　平成７年(1995)１月12日

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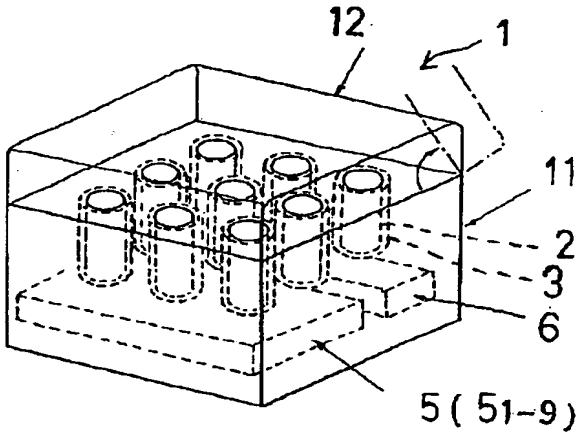
(54)【発明の名称】　個別温度調整庫

(57)【要約】

【目的】　異なる温度条件の試験等の同時進行ができ、温度の立ち上がりが早く、高精度の温度調整が簡便にでき、安定した温度環境が保て、小型簡便で且つ高性能な個別温度調整庫（特に培養器）を提供する。

【構成】　箱体１と、該箱体内に配置され且つ複数の被検物充填容器７を収容する複数の熱伝導性材質製収容容器２と、各収容容器を加熱する各加熱手段（収容容器に取り付けられる可撓性面状発熱体）３と、各収容容器に取着される各温度センサ４と、各加熱手段及び各温度センサに電気的に接続され且つ所望の設定温度になるように個別的に温度制御ができる制御回路５とを備える。面状発熱体３は樹脂製若しくはゴム製の基材層３１とこの上に形成される発熱パターン層３２を備える。この複数の収容容器２と加熱手段３と温度センサ４とにより一ユニットを構成し、該ユニットの１以上が箱体１内に収納される。



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【特許請求の範囲】

【請求項１】　箱体１と、該箱体内に配置され且つ複数の被検物若しくは被検物充填容器を収容する複数の収容容器２と、該各収容容器を加熱する各加熱手段３と、該各収容容器に装着される各温度センサ４と、該各加熱手段及び該各温度センサに電気的に接続され且つ所望の設定温度になるように個別的に温度制御ができる制御回路５と、を備え、

上記収容容器２は熱伝導性材質からなり、上記加熱手段３は、該収容容器に取り付けられる可撓性面状発熱体からなり、該面状発熱体は樹脂製若しくはゴム製の基材層３１と該基材層上に形成される発熱パターン層３２を備え、

上記複数の収容容器と上記複数の加熱手段と上記複数の温度センサとにより一ユニットを構成し、該ユニットの１以上が上記箱体内に収納されることを特徴とする個別温度調整型容器。

【請求項２】　上記個別温度調整型容器は培養器として使用される請求項１記載の個別温度調整庫。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、個別温度調整庫に関し、更に詳しくは、異なる温度条件の試験等の同時進行ができ、温度の立ち上がりが早く、高精度の温度調整が簡便にでき、安定した温度環境が保て、小型簡便で且つ高性能な個別温度調整庫に関する。特に、本発明は、異温度にて培養若しくは反応させた後分析したり、異温度下に保持した後所定物性等を分析したりする場合等に用いられる庫（容器）に利用される。

【０００２】

【従来の技術】細菌類の研究又は温度に対する反応性及び物性の影響を調べるための試験等において、被検物を所定の温度環境に一定時間（又は期間）保つ必要性は多く存在する。このための装置としては、恒温恒湿槽、温水循環式培養槽及び簡易な恒温ケース等が使用されている。

【０００３】上記恒温恒湿槽８は、図６に示すように、本体外函８１、収容庫８２、収容庫の前面側の開口部８３、内扉８４及び外扉８５を備え、この内扉８４及び外扉８５は、開口部８３を閉塞するために、それぞれ開閉自在に本体外函８１に取り付けられている。ウォータジャケット８６は、収容庫８２を包み込むようにして本体外函８１内に形成されている。更に、ヒーター８７、庫内温度センサー８８、水温センサー８９、入力手段８９ａ及び制御装置８９ｂを備え、入力手段８９ａにより指定された設定温度と庫内温度センサ８８及び水温センサ８９の出力信号に基づき、制御装置８９ｂがヒーター８７の駆動制御をすることにより、庫内温度が設定温度に等しくなるように調整される。尚、他の恒温恒湿槽としては、上記のウォータージャケットの部分を空気層に置き替え、ファンにより温度調節を行う空気循環方式のものもある。

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【０００４】上記温水循環式培養槽９は、図７に示すように、培養槽９１、温水を培養槽９１へ送り込む循環ポンプ９２及び三方自動調整弁９３を備え、培養槽温度調節計９５の制御出力信号により培養槽９１へ流入する温水量を制御する。更に、培養槽内温度検出器９４、培養槽温度調節計９５、温水を貯蔵する温水槽９６、加熱ヒーター９７、冷却水供給用の冷却水弁９８、温水槽内温度検出器９９及び温度調節計９９ａを備え、温水槽温度調節計９９ａの制御出力信号により加熱、冷却を行う。

【０００５】上記恒温ケース１０は、図８に示すように、本体外函１０１及び内函１０２を備え、空間部１０３で内函１０２と本体外函１０１により密閉空間となっている。更に、前扉１０４及び収容庫１０５を備え、前扉１０４を閉じることにより外気と遮断される。更に、ヒーター１０６、循環ファン１０７、温度センサー１０８及び温度調節装置１０９を備え、温度センサー１０８の出力信号に基づき、温度調節装置１０９がヒーター１０６の駆動制御をして温度調節をするとともに、循環ファン１０７が収容庫１０５を包んでいる空気を循環させて全体が均一な温度となるようにする。尚、他の恒温ケースとしては、上記の空間部と循環ファンを無くし、収容庫の底面、背面、側面の何れか（又は複数）にヒーターを貼付した構成のものもある。

【０００６】

【発明が解決しようとする課題】しかし、上記従来の３つの恒温槽等については、いずれも以下に示すような問題点がある。

（１）収容庫全体を所定温度にするための予熱時間が、事前に長時間必要である。即ち、培養ビン等の周囲に空気の対流余地を必要とするため、収容庫全体の容積は培養ビン等の容積に比し３～５倍の広さを必要とする。その全体を一定温度に至らせるための予熱時間が必要である。更に、収容庫を所定温度にするには、先ずそれを含む水又は空気の温度を制御し、二次的に収容庫を安定温度にする段階をたどる。また、扉の開閉等による温度影響を少なくするために、外周の水又は空気の熱容量を収容庫に比べ十分大きくしているため、予熱のための準備時間は数時間を要するのが一般的である。

【０００７】（２）１つの恒温装置で同時に異なる温度条件の培養・反応等を並行して実施することは極めて困難である。即ち、収容庫全体を一定温度にする構造であり、１つの恒温装置で同時に異なる温度条件の培養・反応等を並行して実施することはできない。従って、温度条件を何段階かに変えた時の差異を同時進行させて比較したい場合には、同様な恒温装置を複数個用意する必要がある。

【０００８】（３）装置が大きく、培養・反応等の試験結果を出すまでに時間がかかる。例えば、耳鼻咽喉科や

歯科等の担当医が患者から体液・組織の一部等を採取し、その場で短時間の培養をして病菌の状況等を早く診断したいと考えても、現状の培養器では迅速に結果を出すことができない。また、１装置にて同時に温度条件を変えた試験を行うことができないので、１装置でこの試験を行うとすれば、各設定温度に保持する試験を複数回、繰り返して行うこととなるので、その試験に時間がかかる。本発明は、異なる温度条件の試験等の同時進行ができ、温度の立ち上がりが早く、高精度の温度調整が簡便にでき、安定した温度環境が保て、小型簡便で且つ高性能な個別温度調整庫を提供することを目的とする。

【０００９】

【課題を解決するための手段】本発明の個別温度調整庫は、箱体１と、該箱体内に配置され且つ複数の被検物若しくは被検物充填容器を収容する複数の収容容器２と、該各収容容器を加熱する各加熱手段３と、該各収容容器に装着される各温度センサ４と、該各加熱手段及び該各温度センサに電気的に接続され且つ所望の設定温度になるように個別的に温度制御ができる制御回路５と、を備え、上記収容容器２は熱伝導性材質からなり、上記加熱手段３は、該収容容器に取り付けられる可撓性面状発熱体からなり、該面状発熱体は樹脂製若しくはゴム製の基材層３１と該基材層上に形成される発熱パターン層３２を備え、上記複数の収容容器と上記複数の加熱手段と上記複数の温度センサとにより一ユニットを構成し、該ユニットの１以上が上記箱体内に収納されることを特徴とする。

【００１０】上記可撓性面状発熱体を取り付ける場所は、通常は、上記収容容器の外側周表面であるが、これに限定されず、この収容容器の底面、又は蓋を取着する場合はその蓋に、更にはそれらの２か所以上に取り付けてもよい。更に、この取付け場所は、この収容容器の外側に限定されず、内周面に取り付けてもよい。更に、この可撓性面状発熱体の構成は、所定の基材層３１と発熱パターン層３２とを備えればよく、内側に（基材の反対側に）接着層を予め備える面状発熱体としてもよい。更に、この面状発熱体を接着剤にて取り付ける場合にも、この接着剤層はこの面状発熱体の全面でもよいし、その一部、例えば外周縁側のみでもよい。上記個別温度調整型容器は培養器として用いることができる。

【００１１】

【作用及び発明の効果】本発明の個別温度調整庫は、使用する各被検物若しくは被検物充填容器（「被検物等」ともいう。）を各々の収容容器に収容させて、しかもこの各々に面状発熱体を装着しているので、直接被検物を加熱できるとともに、加熱効率も優れる。また、この各面状発熱体を個別に温度制御できる制御回路を備えるので、個別に温度制御できる。従って、本個別温度調整庫を用いれば、温度の立ち上がりが早く、高精度の温度調整を簡便に行うことができ、しかも、異なる温度条件の

試験等の同時進行ができる。しかもその構成をコンパクトにすることもできる。また、温度偏差が微少で、高精度の温度調整を簡便に行うことができ、電力ロス及び時間の無駄が省ける。更に、且つ収容容器の温度を個別に制御するので、隣接個所の被検物等の出し入れの影響を受けず、そのため、常に安定した温度環境が保てる。

【００１２】以上より、本個別温度調整庫によれば、異温度にて培養させたり、反応させたりしてその後の培養物若しくは反応物を分析したり、更に、異温度下に保持した後所定物性等を分析したりする場合等に極めて有用である。更に、装置全体の容積を小さくでき、温度に対する影響を調べる試験を簡易迅速に行うことが必要な場合には極めて有用であり、更に、部分温度管理による部分発熱のため、消費電力の大幅削減ができる。

【００１３】

【実施例】以下、実施例により、本発明を図１～４に基づいて具体的に説明する。本実施例の個別温度調整庫は、培養器として利用されるものであり、この培養器は、箱体１と、９個の収容容器２と、各加熱手段３と、各温度センサ４と、制御回路５とからなる。即ち、収容容器２、加熱手段３及び温度センサ４の組付体が９組あり、しかもこの９組の１ユニットが、箱体１内に収容されている。

【００１４】上記箱体（約１００×１２０×１００ｍｍ）１は、培養ビン７を収容する収容容器２を収納する収納函（約１００×１２０×８０ｍｍ）１１と上蓋１２とからなる。この上蓋１２は収納函１１に開閉自在に取り付けられ、培養ビン７の出し入れ時以外には外気との遮断の働きをする。これらは、アクリル樹脂、ポリプロピレン等からなり、しかも特別な断熱材を使用していない。また、全体の大きさは、全ての収容容器を収容でき、且つ作業に支障のない範囲の最小限の大きさとなっているが、この大きさに限定されるものではない。尚、特別な断熱材を使用することもできるし、他の樹脂製又は金属製とすることもできる。また、培養ビンの代わりに、シャーレのような培養容器とすることもでき、この場合には、この大きさ及び形状に合致した大きさ及び形状の収容容器を用いることとなる。このように平べったいものでは、底面側に加熱手段を備えるのが好ましい。

【００１５】上記収容容器２は、例えば被検物収容可能な培養ビン（被検物が固体の場合若しくは形態物の場合には、このまま使用してもよい。）７を収容できる大きさ及び形状であればよく、例えば、図１及び２に示すように、円筒状のものとすることができる。この場合、図示するように、上端開放でもよいし、上蓋を取り付けられるようにしてもよい。この収容容器２は、培養ビン７の外径（約１８ｍｍφ）より少し大きな内径で薄肉（例えば、約０．５～１ｍｍ）の金属製（例えばアルミウム製）であり、熱伝導性に優れたものである。尚、培養ビン７の中に採取した菌・細胞又は組織の小部分を入れて

培養試験をする。

【００１６】上記加熱手段としては、面状発熱体３を用いる。この面状発熱体３は、収容容器、ひいてはこの中に収容、充填若しくは配置される被検物（液体、固体若しくは形態物等を問わない。）を加熱する。そして、この面状発熱体３は、シリコーン膜基材３１の片面にステンレス箔（発熱パターン層）３２が接着され、可撓性に優れたものである。この面状発熱体３が、収容容器２の外周を取り囲むように、接着層（絶縁層）３３を介して、このシリコーン膜基材３１が外側に且つ密着するように、その全面が接着されている。この発熱パターンは図３に示される。この発熱パターン層３２は、エッチング等の手法により形成される。このパターンは、図３に示すパターンに特に限定されず、所要発熱量が得られるように計算された幅と長さのパターン構成となっていればよい。

【００１７】上記温度センサ（温度検知サーミスタ）４は、各収容容器に装着される。本例では、収容容器２の底面に密接して装着されている。尚、この装着場所はこれに限定されず、側周側でもよいし、収容容器の内面側でもよい。

【００１８】上記制御回路５は、各面状発熱体３及び各温度センサ４に、各々、電気的に接続されており、即ち、収容容器２、加熱手段３及び温度センサ４の組付体が９組あり、その各々に独立した１系統の電子制御回路5_{1-9}が接続されている。これにより、所望の設定温度になるように個別的に温度制御ができるようになっている。この制御回路の１系統を図４に示す。図１中、５は電子回路基板で、９系統の電子制御回路5_{1-9}が１枚のプリント基板に納められている。６は電源回路を示す。この電子制御回路５により、温度センサ４で感知した温度が所定の設定温度より低い場合には、面状発熱体３に電流を供給し、所定温度より高い場合には面状発熱体３への電流を遮断するように動作する。これにより収容容器２の温度は設定温度に保たれる。図４中、５１は温度調節器で、電子制御回路５に含まれており、これにより設定温度を任意に変えることが可能である。

【００１９】本実施例に係る個別温度調整庫においては、各培養ビン毎に各収容容器を設け、各々に面状発熱体を密接装着しているので、個別に制御して温度調整ができる。従って、必要最小限の部分の加熱ですむため、温度の立ち上がりが非常に早い。例えば、冷蔵庫で保冷（５～８℃）したものを体温と同じ３７℃にする場合、５分以内で到達し安定させることができる。また、温度偏差が微少（本実施例では±０．２℃以内）で、高精度の温度調整を簡便に行うことができ、電力ロス及び時間の無駄が省ける。更に、個別に制御するため、隣接個所の培養ビンの出し入れの影響を受けず、常に安定した温度環境を保つことができる。

【００２０】また、異なる温度条件の培養試験を、１つの容器の中で並行して同時進行させることができる。例えば、同種サンプルを、それぞれ４０℃、５０℃、６０℃等の異なる温度条件下で、所定時間（例えば一定時間）培養させて、比較試験を同時に行うことができる。従来では複数の恒温槽を同時に使うため、装置コスト及び多くの場所を必要とし、また、１つの装置で行う場合には、１試験ずつ順次行うため、時間がかかるとともに、同時比較試験ができなかった。更に、一定時間毎に抜き取ったサンプルを、順次、３０℃→４０℃→５０℃→４０℃→３０℃等のサイクルテストして評価したい場合にも、各々同時に所定温度に設定できるので、従来と比べて、迅速な評価ができる。また、装置全体の容積が小さくでき、更に、部分温度管理による部分発熱のため、消費電力の大幅削減ができる。

【００２１】以上より、本培養器は、耳鼻咽喉科や歯科等の専門担当医が、患者から採取した鼻汁・痰・唾液・歯垢等を定温で定時間培養した後、病菌の有無や状況を自ら確認・診断して適切な処置をするために最適な、小型簡便で且つ高性能なものである。

【００２２】尚、本発明においては、前記具体的実施例に示すものに限られず、目的、用途に応じて本発明の範囲内で種々変更した実施例とすることができる。例えば、制御回路の接続は、必ずしも収容容器１個で１ユニットに限定する必要はなく、例えば縦又は横列に、複数ユニットを組み合わせた構成とすることができる。例えば、図５に示すように収容容器及び面状発熱体及び温度センサ３個づづ（２-1～3 及び３-1～3 及び４-1～3 、２-4～6 及び３-4～6 及び４-4～6 、２-7～9 及び３-7～9 及び４-7～9 ）を１ブロックとし、その各々に１ユニットの制御回路（５-1、５-2、５-3）を接続してブロック毎に同一温度に制御する構成としてもよい。もちろん、その数の組み合わせの設定は限定されない。更に、配置についても並置に限定されず、積層配置することもできる。

【図面の簡単な説明】

【図１】実施例に係る個別温度調整庫の全体斜視図である。

【図２】実施例において用いた収容容器及び面状発熱体を示す説明断面図である。

【図３】実施例において使用した面状発熱体の発熱体パターンを示す説明図である。

【図４】実施例において使用した制御回路の１系統を示す説明図である。

【図５】別の実施例における接続系統を示す説明図である。

【図６】従来の恒温恒湿槽の説明断面図である。

【図７】従来の温水循環式培養槽の説明図である。

【図８】従来の恒温ケースの説明断面図である。

【符号の説明】

１：箱体、１１：収納函、１２：上蓋２、収容容器、

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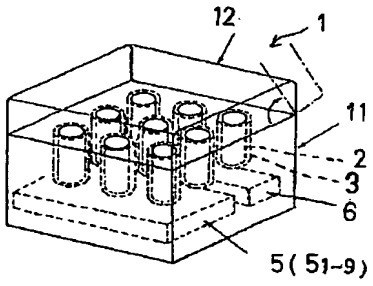
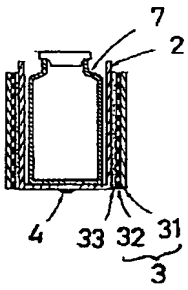
３；加熱手段（面状発熱体）、３１；シリコーン膜基材、３２；ステンレス箔、３３；絶縁層（接着層）、＊４；温度センサ、５；制御回路、６；電源回路。

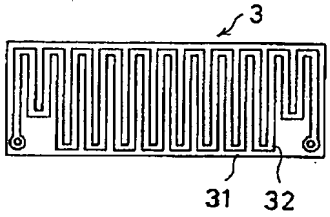
【図１】



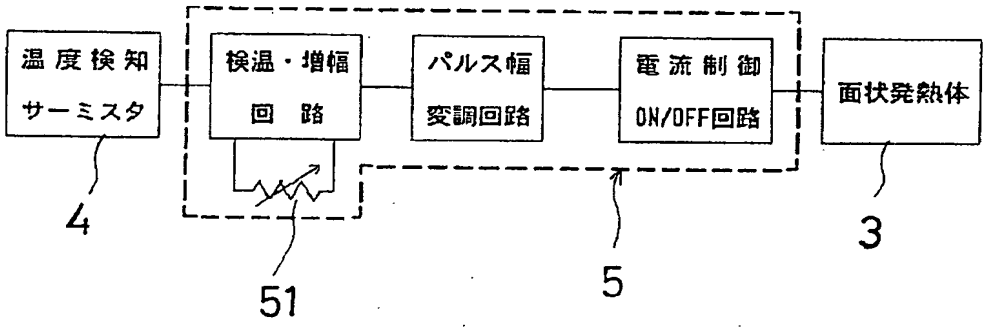
【図２】



【図３】



【図４】



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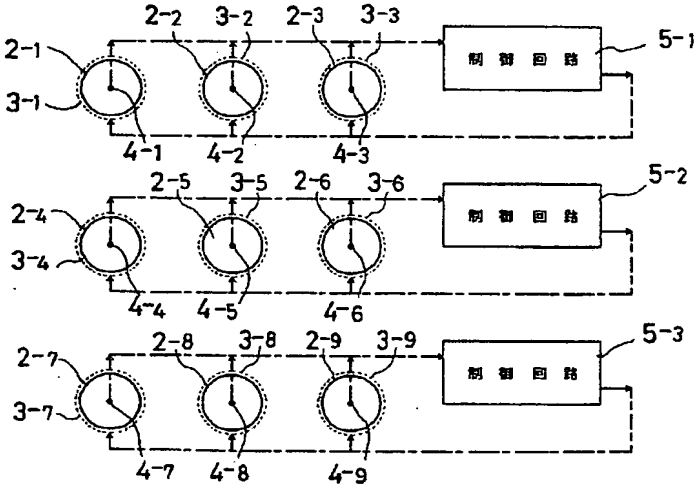

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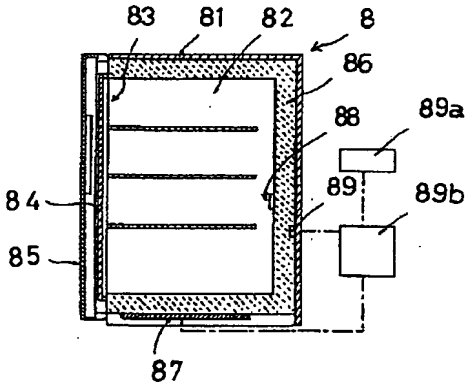

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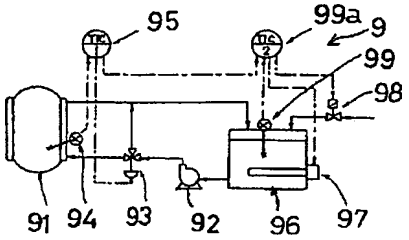
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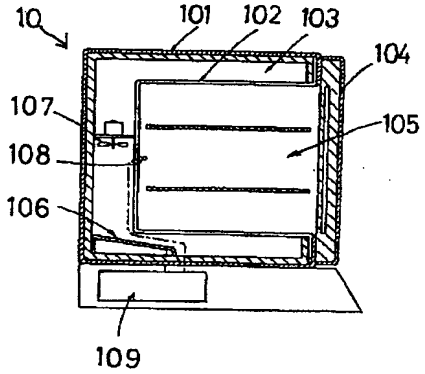
【図８】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